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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US98/21619</p> <p>(22) International Filing Date: 14 October 1998 (14.10.98)</p> <p>(30) Priority Data: 08/949,893 14 October 1997 (14.10.97) US</p> <p>(71) Applicant: MERIT MEDICAL SYSTEMS, INC. [US/US]; 1600 West Merit Parkway, South Jordan, UT 84095 (US).</p> <p>(72) Inventors: MOTTOLA, Jim; 1843 West 10740 South, South Jordan, UT 84095 (US). CARLSTROM, Steve, W.; 2250 East Kensington Avenue, Salt Lake City, UT 84108 (US). POURSAID, Andy, E.; 8358 South Willowcreek Drive, Sandy, UT 84093 (US).</p> <p>(74) Agents: NYDEGGER, Rick, D. et al.; Workman, Nydegger &amp; Seeley, 1000 Eagle Gate Tower, 60 East South Temple, South Jordan, UT 84111 (US).</p>	<p>(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published With international search report.</p> <p>目 的 効果的な薬液散布</p> <p>特 徴 図1 血管に液体を導入するカテーテルにおいて先端部に複数の側孔(注入孔)を有し、数個毎にセツト分けられ同一セツトの孔は互いに軸方向に規則的に配列される。</p>	
<p>(54) Title: CATHETER WITH IMPROVED SPRAY PATTERN FOR PHARMACO-MECHANICAL THROMBOLYSIS THERAPY または、放射状に同一角度(θ)の間隔に</p> <div data-bbox="297 1167 1360 1499"> </div> <p>(57) Abstract</p> <p>An improved catheter (28) includes a double spiral configuration of infusion holes (34) around the circumference and along the length (32) of the catheter (28) which provides an improved lateral dispersion of a thrombolytic fluid to more completely and quickly lyse a clot through which the catheter (28) is passing. The double spiral configuration consists of groups or sets of infusion holes (34), typically groups of four. The holes (34) in each set are longitudinally spaced from each other at substantially regular intervals along the length (32) of the catheter (28). Each successive hole in a given group is circumferentially spaced by an angular distance of about 90° around the circumference of the catheter (28) relative to the immediately preceding hole (34). Each group of holes (34) is circumferentially spaced or offset by an angular distance of between 1° and 89° relative to the immediately preceding group of holes (34). Typically, the angular spacing between successive groups of holes is 18°.</p> <p>この装置は、血管に液体を導入するカテーテルの先端部に複数の側孔(注入孔)を有し、数個毎にセツト分けられ同一セツトの孔は互いに軸方向に規則的に配列される。</p>		

1 A catheter for introducing a liquid into the vascular system comprising:  
an elongated tubular body having a single lumen therethrough and an  
infusion length near a distal end thereof.

5 a plurality of infusion holes disposed along the infusion length of the  
tubular body, said infusion holes being longitudinally spaced along the infusion  
length of the tubular body at substantially regular intervals, said infusion holes  
belonging to a plurality of successive sets of holes, each successive hole within a  
given set being radially spaced apart from each immediately preceding hole within  
10 the given set by an angular distance of about  $\theta$ , each set of holes having a first  
hole and a last hole, each successive set of holes being circumferentially offset  
from an immediately preceding set by an angular distance  $\delta$  such that the first hole  
of an immediately succeeding set is circumferentially offset from the last hole of  
an immediately preceding set by an angle other than a multiple of  $\theta$ .

15 ~~2.~~ A catheter as defined in claim 1, wherein  $\theta = 360^\circ/n$ , wherein  $n$  is an  
integer greater than 1.

~~3.~~ A catheter as defined in claim 2, wherein  $n$  is equivalent to the number of  
holes within each set of holes.

~~4.~~ A catheter as defined in claim 3, wherein  $n = 4$  such that  $\theta = 90^\circ$  and each  
set of holes includes 4 infusion holes.

20 ~~5.~~ A catheter as defined in claim 1, wherein  $\delta$  is an angle in a range selected  
from the group consisting of  $1-89^\circ$ ,  $91-179^\circ$ ,  $181-269^\circ$  and  $271-359^\circ$ .

~~6.~~ A catheter as defined in claim 5, wherein  $\delta$  divides evenly into  $360^\circ$ .

~~7.~~ A catheter as defined in claim 5, wherein  $\delta$  divides evenly into  $90^\circ$ .

~~8.~~ A catheter as defined in claim 5, wherein  $\delta$  equals  $18^\circ$ .

25 ~~9.~~ A catheter as defined in claim 1, wherein the infusion holes are  
longitudinally spaced at regular intervals of about 0.05 inch.

~~10.~~ A catheter as defined in claim 1, wherein the infusion holes have a diameter  
in a range from about 0.002 inch to about 0.006 inch.

30 ~~11.~~ A catheter as defined in claim 1, wherein the infusion holes have a size  
gradient such that in an infusion length having a first hole and a last hole the last hole has  
a diameter greater than the diameter of the first hole.

~~12.~~ A catheter as defined in claim 1, wherein the infusion length includes from between about 40 to about 240 holes.

~~13.~~ A catheter for introducing a liquid into the vascular system comprising: an elongated tubular body having a single lumen therethrough and an infusion length near a distal end thereof.

a plurality of infusion holes disposed along the infusion length of the tubular body, said infusion holes being longitudinally spaced along the infusion length of the tubular body at substantially regular intervals, said infusion holes belonging to a plurality of successive sets of  $n$  holes, each successive hole within a given set of holes being radially spaced apart from each immediately preceding hole within the given set by an angular distance of about  $360^\circ/n$ , each set of holes having a first hole and an  $n$ th hole, each successive set of holes being circumferentially offset from an immediately preceding set by an angular distance of about  $x^\circ$  such that the first hole of an immediately succeeding set is circumferentially offset from the  $n$ th hole of an immediately preceding set by an angle of about  $360^\circ/n + x^\circ$ .

~~14.~~ A catheter as defined in claim 13, wherein  $n$  equals an integer greater than

~~15.~~ A catheter as defined in claim 13, wherein  $n = 4$  and  $x = 18$ .

~~16.~~ A catheter as defined in claim 13, wherein  $n = 5$  and  $x = 15$ .

~~17.~~ A catheter for introducing a liquid into the vascular system comprising: an elongated tubular body having a single lumen therethrough and an infusion length near a distal end thereof.

a plurality of infusion holes disposed along the infusion length of the tubular body, said infusion holes being longitudinally spaced along the infusion length of the tubular body at substantially regular intervals, said infusion holes belonging to a plurality of successive sets of four holes such that each successive hole within a given set is radially spaced apart from each immediately preceding hole within the given set by an angular distance of about  $90^\circ$ , each set of holes having a first hole and a fourth hole, each successive set of holes being circumferentially offset from an immediately preceding set by an angular distance

of  $x^\circ$  such that the first hole of an immediately succeeding set is circumferentially offset from the fourth hole of an immediately preceding set by an angle of about  $90^\circ + x^\circ$ , wherein  $x^\circ$  divides evenly into  $90^\circ$ .

- 5     ~~18.~~     A catheter as defined in claim 17, wherein  $x^\circ$  is equal to  $18^\circ$ .
- ~~19.~~     A catheter as defined in claim 17, wherein the infusion holes are longitudinally spaced at regular intervals of about 0.05 inch.
- ~~20.~~     A catheter as defined in claim 17, wherein the infusion holes have a diameter in a range from about 0.002 inch to about 0.006 inch.

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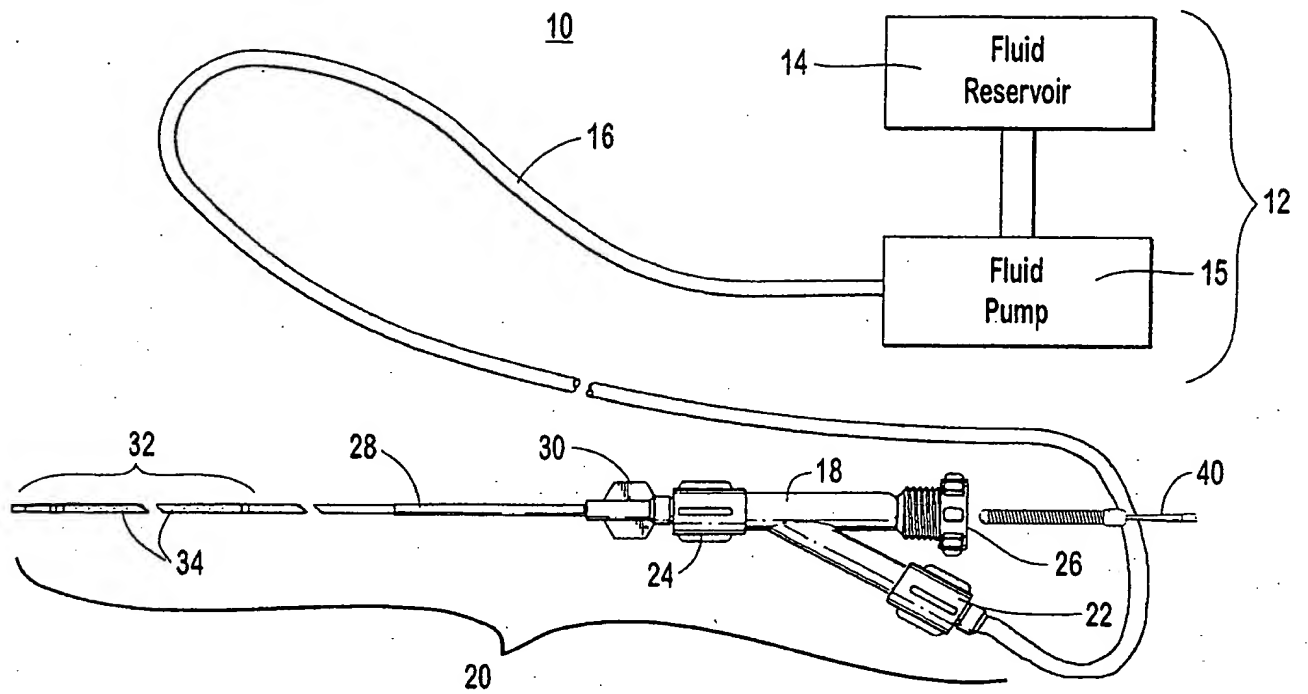


Fig. 1

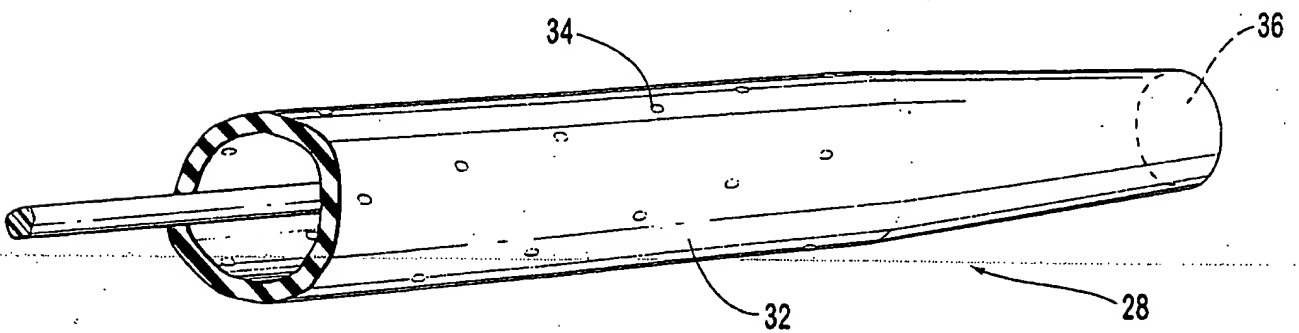


Fig. 2

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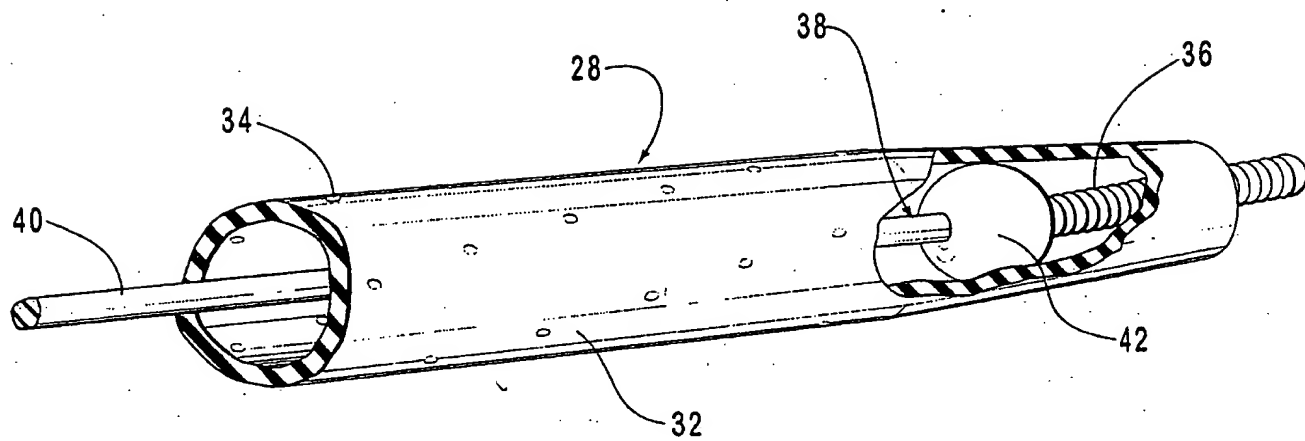


Fig. 3

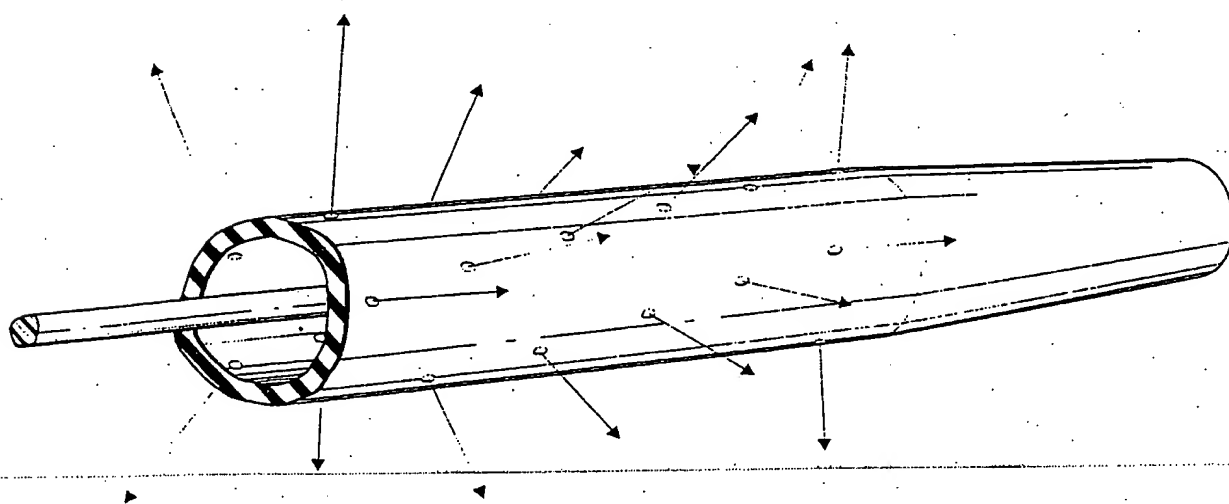


Fig. 4

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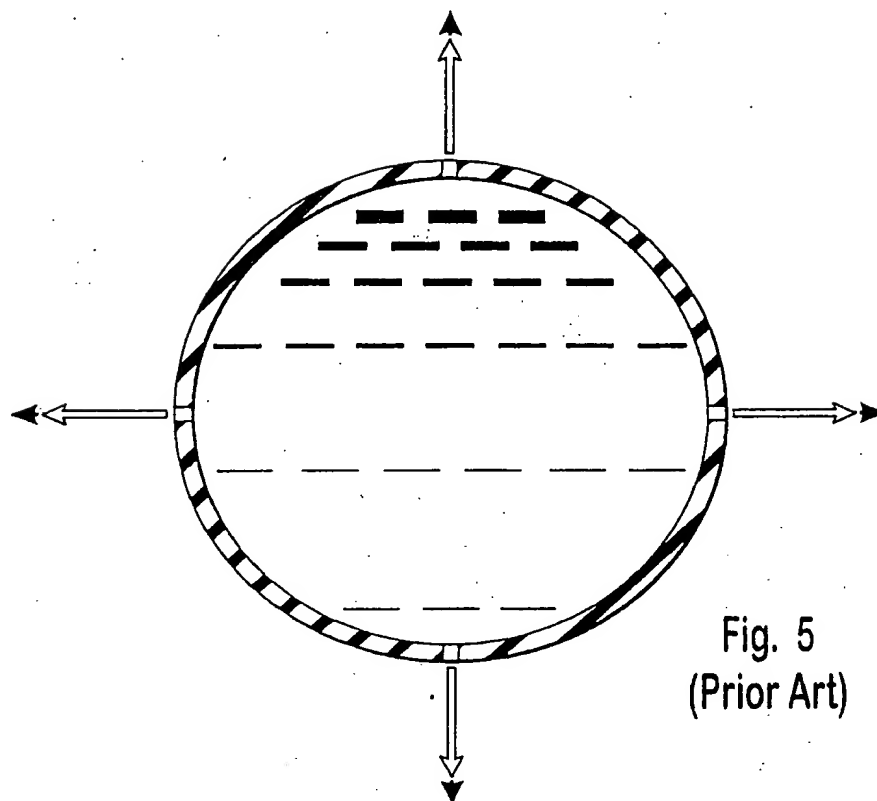


Fig. 5  
(Prior Art)

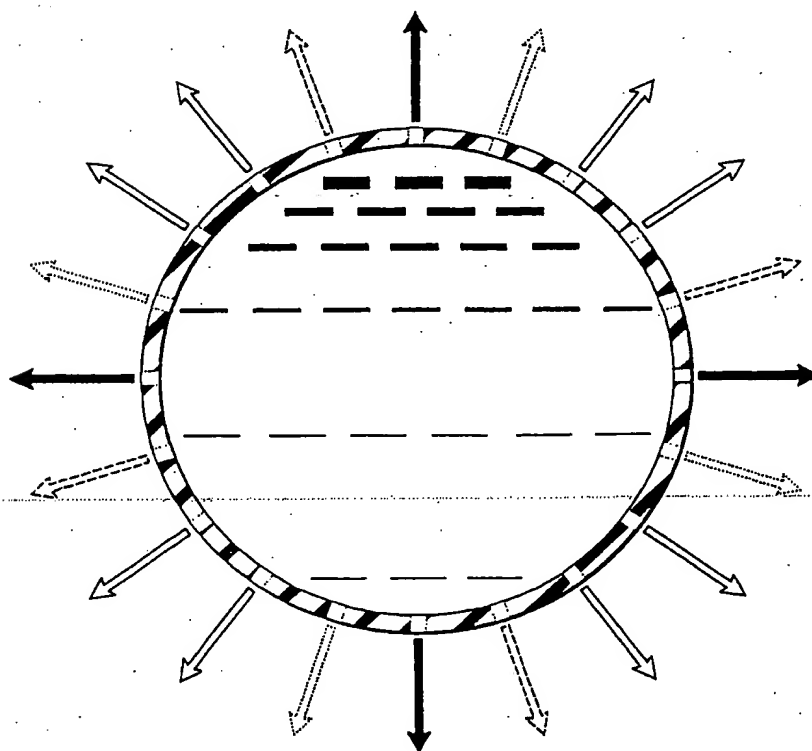


Fig. 6



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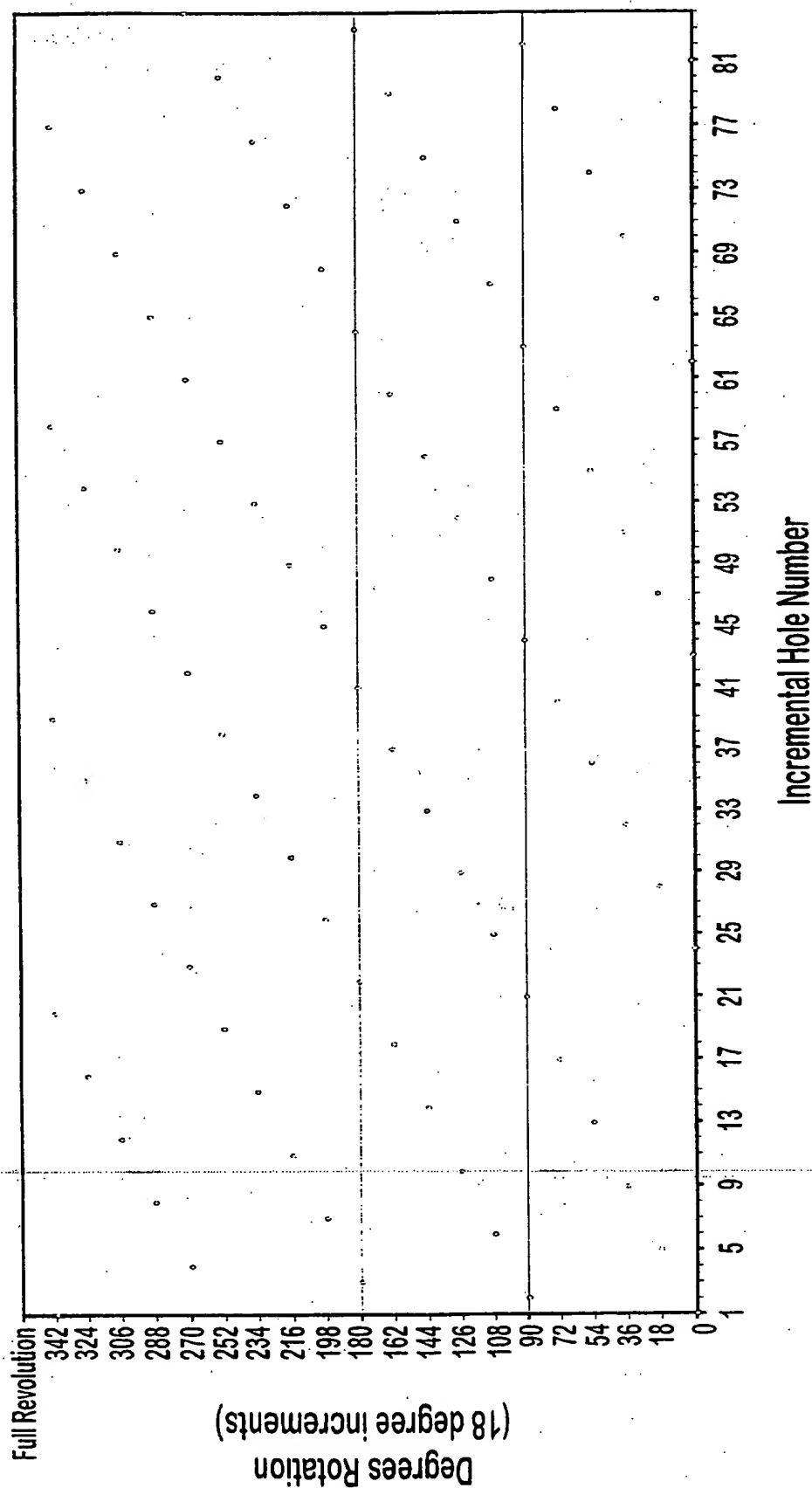


Fig. 7

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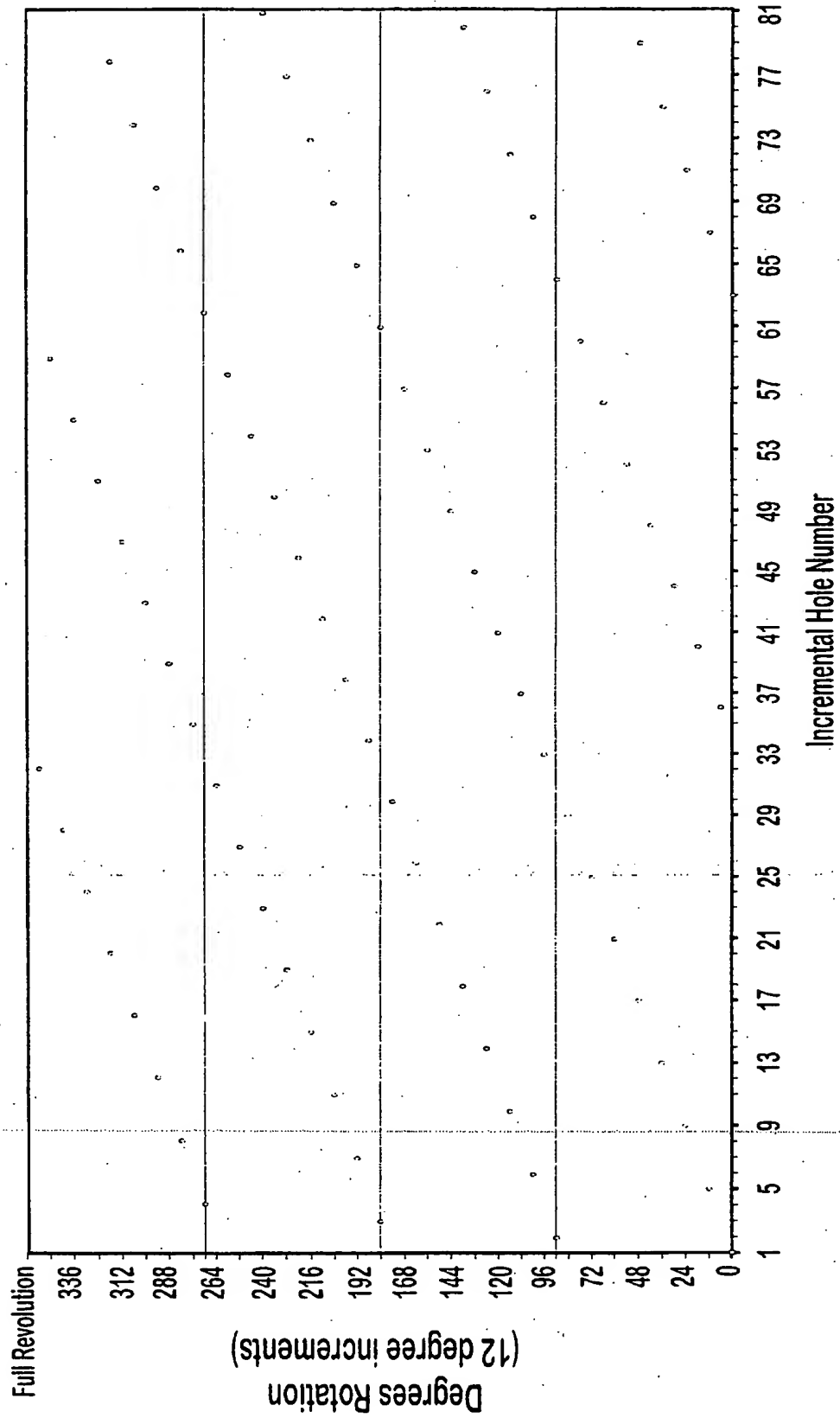


Fig. 8